

Development and evaluation of an artificial intelligence system for COVID-19 diagnosis

Year: 2020 | Citations: 323 | Authors: Cheng Jin, Weixiang Chen, Yukun Cao, Zhanwei Xu, Zimeng Tan

Abstract

Early detection of COVID-19 based on chest CT enables timely treatment of patients and helps control the spread of the disease. We proposed an artificial intelligence (AI) system for rapid COVID-19 detection and performed extensive statistical analysis of CTs of COVID-19 based on the AI system. We developed and evaluated our system on a large dataset with more than 10 thousand CT volumes from COVID-19, influenza-A/B, non-viral community acquired pneumonia (CAP) and non-pneumonia subjects. In such a difficult multi-class diagnosis task, our deep convolutional neural network-based system is able to achieve an area under the receiver operating characteristic curve (AUC) of 97.81% for multi-way classification on test cohort of 3,199 scans, AUC of 92.99% and 93.25% on two publicly available datasets, CC-CCII and MosMedData respectively. In a reader study involving five radiologists, the AI system outperforms all of radiologists in more challenging tasks at a speed of two orders of magnitude above them. Diagnosis performance of chest x-ray (CXR) is compared to that of CT. Detailed interpretation of deep network is also performed to relate system outputs with CT presentations. The code is available at https://github.com/ChenWWWeixiang/diagnosis_covid19. In some contexts, rapid detection of COVID-19 from CT scans can be crucial for optimal patient management. Here, the authors present a Deep Learning system for this task with multi-center data, human reader comparison and age stratified results.